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ABSTRACT

Prior to college-level mathematics coursework, students are not routinely provided with the opportunity to engage in the kind of sustained mathematical thinking necessary to solve complex, multistep problems, most likely because of the difficulties that school mathematics teachers face in communicating problem settings and contexts that are motivating and complex, yet ultimately resolvable by students. This paper outlines the theoretical base, development, and preliminary evaluation of anchored instructional environments (videodiscs) being used with middle-grade students to improve mathematical and scientific thinking processes. Discussed are the proactive motivation due to the video-based format including an embedded data design, the de-emphasis on reading due to a familiar narrative format, the discovery-based learning inherent in student-generated problem resolution, the implicitly manageable levels of complexity, and the possibilities for connections across the school curriculum. Initial preinstruction studies on 12 college students and on 12 high-achieving sixth graders induced extremely poor performance results by the sixth graders, which was not surprising both in view of the less than mediocre performance results of the college students, and in light of the realization that students cannot be expected to exhibit skills that have not yet been developed. (25 references) (JJK)

The Development and Preliminary Evaluation of Anchored Instruction Environments for Developing Mathematical and Scientific Thinking

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and

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Purpose

This paper will outline the theoretical base, development, and preliminary evaluation of anchored instructional environments being used with middle grades students to improve mathematical and science thinking. Due to the nature of the paper, the discussion of certain aspects of the projects described is somewhat limited. Manuscripts detailing various aspects of the projects may be found in the references section at the conclusion of the paper.

Theoretical Base

A major goal of anchored instruction is to allow students and teachers to experience the kinds of problems and opportunities that experts in various areas encounter. Theorists such as Dewey (1933), Schwab (1960) and N. R. Hanson (1970) emphasize that experts in an area have been immersed in phenomena and are familiar with how they have been thinking about them. When introduced to new theories, concepts and principles that are relevant to their areas of interest, the experts can experience the changes in their own thinking that these ideas afford. For novices, however, the introduction of concepts and theories often seem like the mere introduction of new facts or mechanical procedures to be memorized. Because the novices have not been immersed in the phenomena being investigated, they are unable to experience the effects of the new information on their own noticing and understanding.

Anchored instruction environments also share some of the characteristics of inquiry environments which have been suggested as a model, especially for science instruction, since Schwab

(1962). They are similar in that the anchored instruction environments, as well an inquiry environments, do not propose to "directly" instruct students but provide a situation where learning can take place. As will be noted in the descriptions of the development projects, the anchored instructional environments provide a context for other instructional environments which many times will include inquiry activities. For a more detailed discussion of anchored instruction see the Cognition and Technology Group (1990) paper.

Development and Evaluation Efforts

I. The Jasper Series

An example of an anchored instruction is a project being conducted by the Learning Technology Center, initially sponsored by the James S. McDonnell Foundation and now currently receiving National Science Foundation support. It is designed to develop and evaluate a series of videodisc adventures whose primary focus is on mathematical problem formulation and problem solving. However, applications are also being developed that will enable students to learn science, history and literature concepts.

The videodiscs that are being developed involve the adventures of a person named Jasper Woodbury and his friends. Video production on four discs have been completed, with three in final disc format and a fourth in post-production. It is envisaged that a series comprised of 6 to 10 discs will be produced. The discs are designed for use with middle school students, although they have worked with students as young as 4th graders and as old as

college freshmen.

As part of the development effort the following design principles have been developed based upon previous work (See especially, Cognition and Instruction Group, 1990 and in press; Young, et al, 1989; and Bransford, et al, 1986)) and the new National Council of Teachers of Mathematics guidelines (NCTM, 1989).

1. Video-Based Presentation Format. Although some excellent work on applied problem solving has been conducted with materials that are supplied orally or in writing (e.g., Lesh, 1981), the authors decided to use the video medium for several reasons. One is that it is easier to make the information more motivating because characters, settings, and actions can be much more interesting. A second reason for using the video medium is that the problems to be communicated can be much more complex and interconnected than they can be in the written medium--this is especially important for students who are below par in reading. Modern theories of reading comprehension focus on the construction of mental models of situations; students can more directly form a rich image or mental model of the problem situation when the information is displayed in the form of dynamic images rather than text (McNamara, Miller, & Bransford, 1991). Teachers who have worked with the pilot videos have consistently remarked that the video-based adventures are especially good for students whose reading skills are below par. In addition, since there is a great deal of rich background information on the video, there is much

more of an opportunity to notice scenes and events that can lead to the construction of additional, interesting problems in other content areas as well as in mathematics.

2. Narrative Format. A second design principle is the use of a narrative format to present information. One purpose of using a well-formed story is to create a meaningful context for problem solving (for examples of other programs that use a narrative format, see Lipman, 1985). Stories involve a text structure that is relatively well understood by middle school students. Using a familiar text structure as the context for presentation of mathematical concepts helps students generate an overall mental model of the situation and lets them understand authentic uses of mathematical concepts (e.g., Brown, Collins, & Duguid, 1989).

3. Generative Learning Format. The stories in the Jasper series are complete stories with one exception. As with most stories, there is setting information, a slate of characters, an initiating event and consequent events. The way in which these stories differ is that the resolution of the story must be provided by students. (There is a resolution on each disc, but students see it only after attempting to resolve the story themselves.) In the process of reaching a resolution, students generate and solve a complex mathematical problem. One reason for having students generate the ending--instead, for example, of guiding them through a modelled solution--is that it is motivating; students like to determine for themselves what the outcome will be. A second reason

is that it allows students to actively participate in the learning process. Research findings suggest that there are very important benefits from having students generate information (Belli, Soraci, & Purdon, 1989; Soraci, Bransford, Franks, & Chechile 1987).

4. Embedded Data Design. An especially important design feature of the Jasper series --one that is unique to the series and is instrumental in making it possible for students to engage in generative problem solving--is what is called an "embedded data" design. All the data needed to solve the problems are embedded somewhere in the video story. The mathematics problems are not explicitly formulated at the beginning of the video and the numerical information that is needed for the solutions is incidentally presented in the story. Students are then able to look back on the video and find all the data they need (this is very motivating). This design feature makes the problem solving series analogous to good mystery stories. At the end of a good mystery, one can see that all the clues were provided, but they had to be noticed as being relevant and put together in just the right way.

5. Problem Complexity. The Jasper videos pose very complex mathematical problems. For example, the first episode in the series contains a problem comprised of more than 15, interrelated steps. In the second episode, multiple solutions need to be considered by students in order to decide the optimum one. The complexity of the problems is intentional and is based on a very simple premise: **Students cannot be expected to learn to deal with**

complexity unless they have the opportunity to do so (e.g., Schoenfeld, 1985). Students are not routinely provided with the opportunity to engage in the kind of sustained mathematical thinking necessary to solve the complex problem posed in each episode. The video makes the complexity manageable. It is believed that a major reason for the lack of emphasis on complex problem solving (especially for lower achieving students) is the difficulties teachers face in communicating problem contexts that are motivating and complex yet ultimately solvable by students.

6. Links Across the Curriculum. Each narrative episode contains the data necessary to solve the specific complex problem posed at the end of the video story. As well, the narration provides many opportunities to introduce topics from other subject matters. For example, in the trip planning episodes, maps are used to help figure out the solutions. These provide a natural link to geography, navigation, and other famous trips in which route planning was involved, e.g., Charles Lindbergh's solo flight.

A. Initial Findings

1. Baseline (pre-instruction) studies of college students' abilities to solve the problem posed in the first Jasper Adventure, Journey to Cedar Creek (JCC).

In initial studies baseline data is collected on college students' (N=12) abilities to formulate and solve Jasper's problem prior to instruction. It was assumed that these students would be expert at the task and that their responses would serve as

standards for comparison with the younger students.

Students first viewed JCC after which they were individually interviewed. To assist in recall during problem solving, students were provided with still pictures summarizing the story. The interview consisted of 3 levels of questions of increasing specificity. These levels allowed an assessment of problem formulation and problem solving under conditions of increased assistance. At the most general level (hereafter Level 1), no assistance was provided; students were asked to identify the problems that Jasper needed to consider to decide whether he could get the boat home and to solve these problems if they could. Students were asked to talk aloud as they solved the problem. Level 2 consisted of questions designed to cue students to consider each of the major subproblems comprising Jasper's problem, that is, (a) whether Jasper could reach home before sunset, (b) whether he could reach home without running out of fuel, and (c) whether he needed to be concerned about money. As with Level 1, at Level 2 students were asked to identify and solve the problems that Jasper would need to solve to make a decision about each of these subproblems. At Level 3, the subproblems were broken down further into simple word problem-like questions. For example, students were asked to find the distance from Cedar Creek marina to Jasper's home dock.

Transcriptions of the audiotaped interviews and students' written calculations were analyzed with respect to students' problem identification and problem solving. Blind raters

independently scored the transcripts (% agreement exceeded 85% on all transcripts). Raters coded whether students (a) mentioned each of the subproblems comprising Jasper's solution, (b) attempted to solve each of these subproblems, (c) used the correct mathematical formulation to solve each subproblem and (d) produced a correct answer to each subproblem. One point was assigned for each of (a) through (d). Performance was summarized by creating a total score for each student and converting this score to a percentage. Thus, these scores represent the percentage of a complete and accurate solution that is generated by each student.

Contrary to original expectations, college students performed quite poorly on the task. At Level 1, students correctly formulated and solved a mere 28% of the problem. Level 2 prompting resulted in an improvement of students' performance, nevertheless, cumulative performance for Levels 1 and 2 was only about 38% (see Figure 2). Level 3 prompting resulted in the greatest improvement in performance, with students correctly solving an additional 43% of the problem. Indeed, by Level 3 most students were at or near ceiling on the task.

The fact that Level 3 prompting produced the greatest effect on problem solving performance suggests that students' poor performance on the task at Level 1 and 2 was a result of their having difficulty planning and formulating the multi-step problem. The Level 3 data suggest that college students are quite good at formulating and solving the problem when it is presented as a series of one-step problems.

2. **Baseline (pre-instruction) data for high achieving sixth graders on JCC**

This study was designed to collect data for comparison with the problem solving data from the sample of college students. The goal was to examine the relative abilities of the college and middle school groups to articulate a solution plan and to solve the problem in JCC. Middle school participants were 6th grade students (N=12) recruited from an above-average math achievement class. Students' mean score on the mathematics portion of the Stanford Achievement Test was 83%. Problem solving performance was assessed through individual interviews with students. The same interview protocol and procedures were used with the 6th graders as were used in the initial baseline study with college undergraduates.

Students' overall problem solving performance in summarized in Figure 2. It is clear from the figure that even though the students were high achievers in mathematics, they performed very poorly, regardless of level of prompting. Less that a fifth of the students, even when prompted, correctly formulated and solved the problems.

Table 1 contains a breakdown of Figure 2. The table indicates the proportion of students who identified and solved the problems at each level of prompting. At Level 1, 73% of the students restated the major questions presented at the end of the video, but none of the students discussed Jasper's need to buy gasoline on the way home. Fewer than half of the students attempted to solve the problems they identified, and none of the students completely and

accurately solved a major problem. At Level 2, a greater proportion of students attempted to solve the problems they identified, but there was only one problem (i.e., does Jasper have enough time to get home before sunset?) for which a correct solution was produced and only 9 % of the students generated correct solutions for this problem. Prompting at Level 3 resulted in greatly increased attempts to solve the identified problems and greater proportions of students who successfully completed solutions. However, on only one problem (i.e., does Jasper have enough gasoline to reach home?) did more than half of the students produce correct solutions.

The results indicated that the students were unsuccessful in planning a solution and solving the problems without assistance from the experimenter in identifying subproblems. Although students are relatively good at solving already-formulated single step story problems of the same types as those contained in the JCC problem, the results indicate that students have great difficulty when these problems are part of a multi-step problem that requires planning and formulation.

The sixth grade results of were not surprising in view of the data indicating that even college freshmen do relatively poorly on the JCC problem. Students rarely have the opportunity to attempt to solve complex problems like the one in JCC and hence cannot be expected to have developed these problem solving skills.

Group differences on qualitative aspects of problem solving are particularly interesting. For example, one of the project

goals is to examine possible group differences in the plans that students generate and in the types of errors that they make.

3. Observations of experienced teachers using JCC

To develop ideas for ways to teach the Jasper series in classrooms, it was fortunate to have had the opportunity to work closely with several middle school teachers whom had originally been met through an NSF teacher enhancement project. These teachers were willing to use the materials in their classrooms on an experimental basis and to provide feedback and the opportunity to observe their classes. In addition, the project staff received written feedback from many other teachers and their students.

The teachers provided many examples of effective and creative ways to use the discs, and models for how to use them with different classroom organizations (i.e., teacher-directed/whole class format and student- directed/small-group format). It is beyond the scope of this paper to describe their ideas in detail, however, included are examples of how some of the teachers used the videos to teach planning and problem formulation.

In one approach used for JCC, the teacher first showed the video from beginning to end. She then structured a brainstorming session where the whole class shared their ideas about the problems that Jasper would need to consider to decide if he could make it home in his new cruiser. The teacher listed these problems on the board, occasionally guiding them to elaborate their plans for certain subproblems. The teacher discouraged students from performing any calculations at this point. Her rationale was that

she wanted to help students internalize a solution plan and did not want students to get bogged down by thinking about computational procedures.

Having helped students identify the subproblems that Jasper would need to consider to solve his major problem, it was observed that many teachers would then guide students to think about the mathematical information needed for computing solutions to these subproblems. In JCC for example, teachers might ask students to decide what information they would need to determine how much time Jasper had before the sun went down. After reaching a consensus on the type of information that they would need (i.e., Jasper's departure time and the time of sunset), they would then prompt students to recall the information. Many times a student or several students remembered the needed facts; on other occasions, none could retrieve the information. In the latter situations, teachers would prompt students to consider whether and where this information had been presented in the video, and then search the disc for the relevant scene to replay for students.

The experience of watching and conversing with teachers has been invaluable. It has enabled project staff to develop suggestions for instruction that will be incorporate in the teacher training materials that will accompany the videodisc series. It has also provided information about mathematics concepts and computations that middle school students find particularly difficult. It will allow the project to alert teachers to these difficulties in the training materials and will provide text- and

video-based suggestions for ways to remediate them. In addition, as a result of collaboration with teachers project staff developed lesson plans for JCC that were subsequently used in on-going instructional research.

4. Observations of experienced teachers using JCC to teach cross-curricular aspects such as science and social studies.

One of the project teachers teaches fifth and sixth grade mathematics and science at a middle school, near Nashville. He used JCC to teach simple machines in a way that was very motivating to his students. He showed them segments from the videodisc and asked them to raise their hands as soon as they saw an example of a simple machine. He then asked the students to explain their reasoning and tell how the machine worked. The students were highly motivated and readily entered into in-depth discussions.

5. A transfer study to compare the effects on fifth graders of excellent instruction in traditional word-problem solving instruction with instruction in the context of JCC.

The overall goal of the study was to determine if anchored instruction with Jasper would produce learning and transfer of learning that was not experienced by students instructed in word problem solving as presented in a traditional curriculum.

Participants were a fifth-grade class of above average students. Based on students' scores on the mathematics section of the Stanford Achievement Test, a stratified random assignment was made of students to experimental or control group teaching conditions.

Instruction for the Experimental Group. Students in the experimental group investigated the major questions Jasper had to answer. As each question (i.e., time fuel and money) was introduced in class, students were encouraged to generate subordinate questions of the stated question and to recall relevant facts from the video to answer the questions. This segment of instruction was designed to engage students in planning for problem solving and to focus their attention on gathering the needed information. Students were guided to generate complete solutions for all of the subproblems identified. Conversely, as subproblem solutions were generated, students were encourage to relate the solutions to the overall problem. Students engaged in problem solving as a class, in small groups, and on an individual basis.

Control Group Instruction. Control students viewed JCC along with experimental students the first day of the study. They did not, however, receive instruction in solving Jasper's problems. Traditional teaching methods--teacher lecture, question and answer, worksheets, and teacher and student presentations at the chalkboard--were used to instruction control students in traditional word problems. The problems involved distance, elapsed time, rates, fuel consumption, and money, topics around which the overall problem in Jasper was structured. The following example typifies problems solved by control students:

Bill's car averages 25 miles per gallon of gas. At that rate, how many gallons of gas will Bill need to drive 480 miles?

Control students also studied Polya's (1957) problem solving model and were encouraged to apply the model during problem solving.

Results and Discussion. A pretest and two posttests were administered to experimental and control students. One of the posttests consisted of word problems of the type that students in the control group received during training. This measure allowed the comparison of performance of experimental students to that of control students who were instructed in solving these more routine problems. Somewhat surprisingly, experimental students were able to solve these problems as well as control students despite the fact that the control group had much more explicit practice on these types of problems. Both groups performed quite well on this measure, averaging 77% correct.

A paper and pencil pretest and an identical posttest were designed to assess how well students organized information in the Jasper video for problem solving before and after instruction. Students were asked to match factual information needed for solving Jasper's central problems with the appropriate problem. For example, the amount of money Jasper had left would be relevant to the problem of purchasing fuel needed to make the trip home. Experimental students showed significant gains from pretest to posttest while control students showed no significant improvement.

The most dramatic finding involved student performance on The Houseboat Adventure video transfer test. This measure was designed to allow assessment of students' abilities to identify, define, and

solve problems similar to those posed in JCC and had somewhat a similar format to the JCC adventure. Performance data were collected in individual interviews with children. Two levels of prompting were provided. These levels corresponded to Levels 1 and 2 described earlier for the JCC baseline study.

Scores assigned to the interview protocols reflected the completeness and accuracy of the student's problem solutions at each level of prompting. Figure 3 contains a summary of student's problem solving performance on the transfer task. As each level of prompting, protocol scores of students in the experimental group were significantly higher than those of control students. It is evident that, following four sessions o. instruction with JCC, experimental students showed significant transfer of learning to a new, similarly-complex problem compared to the control students. Several of the experimental students' scores were in the 75%-100% range. The maximum control student score was 51%. These results are quite different from those obtained in the baseline study involving students who received no problem solving instruction.

Experimental students showed great strength in identifying and solving the central distance-rate-time and fuel problems involved in the transfer video. Most of their difficulties seemed to stem from not considering carefully the subordinate problems relating to buying gasoline on the return trip. Several of the students appeared to assume that the character in the transfer story could "somehow" obtain the gasoline on the way home. Although most of the experimental students correctly determined the amount of money

left after expenses, few related the result to decisions that needed to be made regarding quantity of gasoline that could be bought on the return trip.

Control students were generally unsuccessful in formulating and solving the video-based transfer problems. Control students, like experimental students, had particular difficult with decision making relative to the problem of buying gasoline on the way home. One difficulty evident in control students' protocols that was not show in the protocols of experimental students involved units of measurement. Some control students mixed units (e.g., added hours and miles) and seemed to make little distinction in rates (e.g., minutes per mile and miles per minute). This finding suggests that one benefit of the instruction anchored in the video context may have been clarification of units of measurement.

The need to provide experiences with complex examples of problem formulation is illustrated by the data with 6th graders. Although these students had scored above average on standard mathematics achievement tests (Vye, et al., 1989), they were extremely poor at problem identification and formulation (this finding was expected since students have few experiences like this). However, the data also indicate that fifth grade students can become very good at complex problem formulation on tasks similar to Jasper after working with Jasper in cooperative learning groups for 4 to 5 class sessions (Van Haneghan, et al., 1989). Additionally, it was also found that teachers were extremely enthusiastic about Jasper, mainly because their students seem to

be challenged to solve the problems and because even students who normally are not good at math can contribute to problem solving; for example, they may have noticed information on the disc that is relevant for solving Jasper's problem.

II. The Golden Statuette

A second project being developed using the principles of anchored instruction is a short video titled "The Golden Statuette". This video has as its primary content area that of science, specifically the concept of density. While less developed than the Jasper series materials, it provides an example of how similar design principles can be used in another content area.

The video again uses a story as its mechanism to create an everyday type environment with an authentic task. Briefly, the story line is one of a young man who needs some money to buy a guitar and gets the idea to spray paint a small statue gold to try and sell it. He takes the statue to a "trading company" where a young woman examines it. She weighs it, uses water displacement to check its volume, does some calculations, and consults tables. She then offers him twenty cents for his "treasure".

As with the Jasper series, the viewer is never told that this is an video about density, no terminology such as mass or volume are mentioned and no formulas are presented. Instead the viewer sees a situation where a person has collected some data, done some calculations and answered an important question all within five minutes.

Field testing of "The Golden Statuette" has only occurred on

a limited basis, at the present time, with a small number of students. Students were asked to retell the story and then describe how the young woman in the trading company knew the statue was not real gold. Their responses were not especially strong, consistent with the general knowledge level of students on the concept of density, which usually indicates that while students study density multiple times in school their ability to use the concept to solve problems is generally poor (Hewson, 1986; Frenette, 1988).

In a recently conducted study by Barnes, Barnes & Andriesse (1990), tney used The Golden Statuette with preservice elementary school teachers. Their study was designed to give some indication as to the knowledge level of these students about density as well as pilot some ideas on how the video could be used to teach the density concept to both preservice teachers and school age children. Their results on the knowledge level, as measured by responses to a question asking the students to explain how the young woman knew the statue was not gold, indicated the expected results. Over 90% of the preservice teachers could not explain, using density concept ideas, how the woman knew the statue was a fake.

III. Scientists in Action

Work is beginning to expand the use of anchored instruction with other science based videos in a series tentatively titled "The Scientist in Action Series". This series of videodiscs will involve adventures where science concepts are used to solve complex

problems. The first of these videos has been shot and involves the following story line. The camera viewpoint is that of a summer intern in a county hydrologist's office. At the start of the video, information is received that a tanker has overturned on a road near a river. A chemical is spilling into the river and appears to be very dangerous. The video continues showing some of the steps the hydrologist, and related professionals, must take to determine if the spill is hazardous and what actions need to be taken. The story has pauses were students viewing the video must get additional information from print materials and then make decisions about actions to take. The finished video has been completed so recently that no field tests of it have yet been conducted.

[1] The members of the Technology and Cognition Group at Vanderbilt University include: Linda Barron, John Bransford, Bill Corbin, Laura Goin, Elizabeth Goldman, Susan Goldman, Ted Hasselbring, Charles Kinzer, Tim McNamara, Ann Michael, Diana Miller, Jim Pellegrino, Vicki Risko, Dan Rock, Robert Sherwood, Salvatore Soraci, Thomas Sturdevant, James Van Haneghan, Nancy Vye, Susan Williams, and Michael Young.

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FIGURE 2.

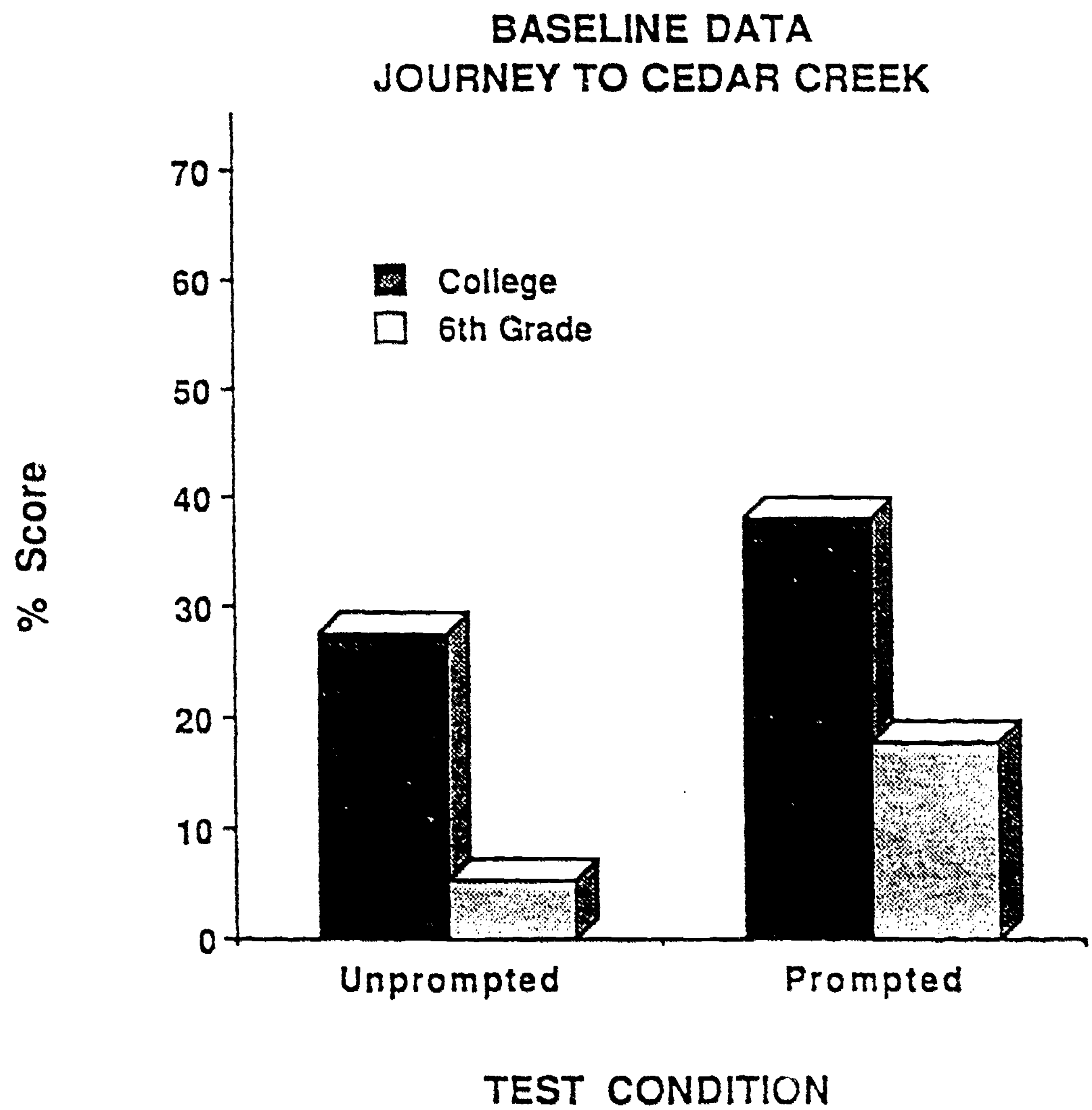
BASELINE DATA
JOURNEY TO CEDAR CREEK
70
60
50
40
30
20
10
0
% Score
College
6th Grade
Unprompted
Prompted
TEST CONDITION

FIGURE 3.

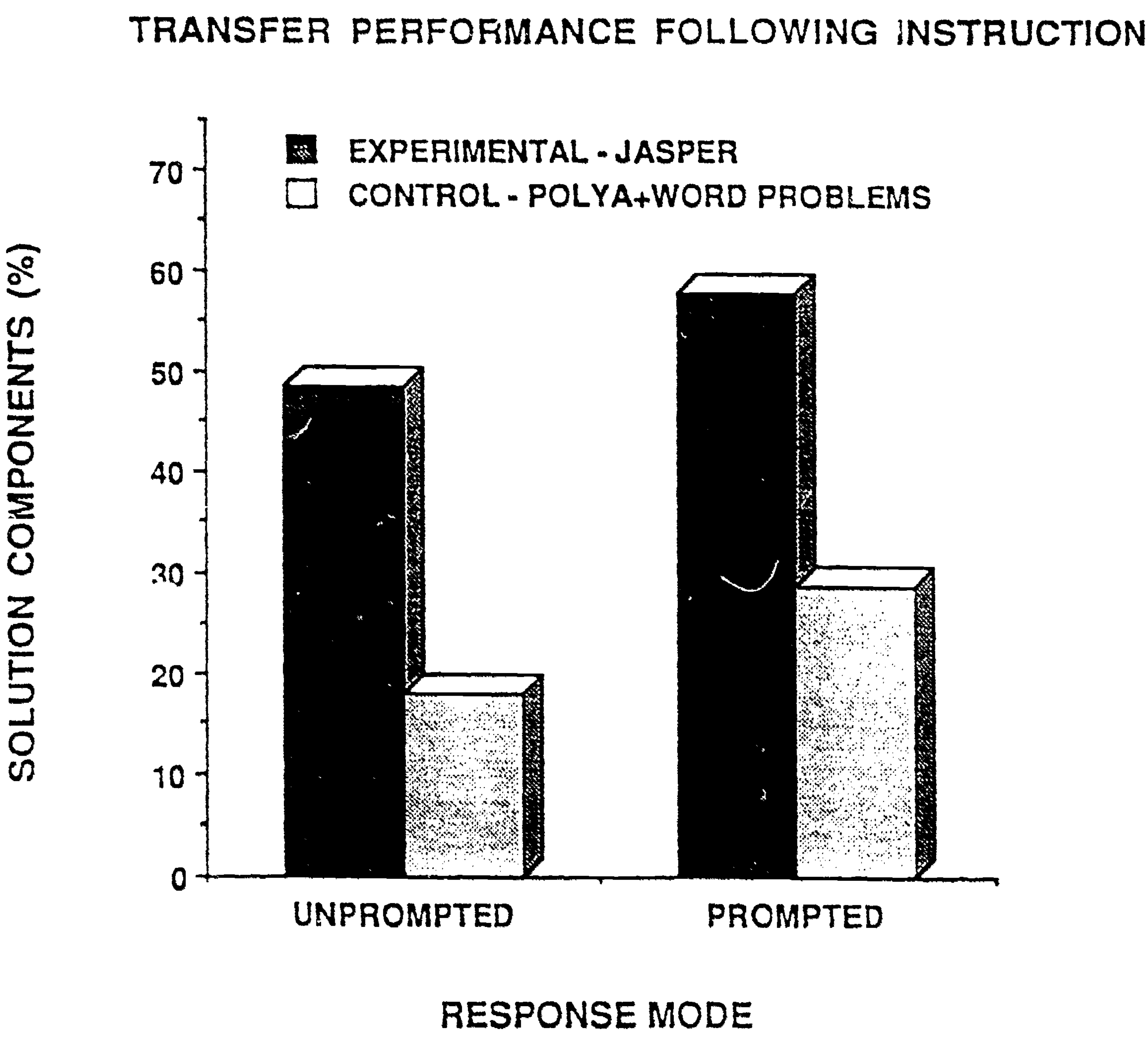
TRANSFER PERFORMANCE FOLLOWING INSTRUCTION
EXPERIMENTAL - JASPER
CONTROL - POLYA+WORD PROBLEMS
SOLUTION COMPONENTS (%)
0
10
20
30
40
50
60
70
UNPROMPTED
PROMPTED
RESPONSE MODE

TABLE 1.

Proportion of Sixth-grade Students Who Formulated Video Problems--Baseline Study

Problem	Level I			Level II			Level III*	
	% Mentioning Problem	% Attempting Solution	% Solving Problem	% Mentioning Problem	% Attempting Solution	% Solving Problem	% Attempting Solution	% Solving Problem
Enough Time?	73	45	0	91	91	9	100	0
Enough Fuel?	73	36	0	91	91	0	100	55
Obtain Fuel at Willie's?								
Enough Time?	0	0	0	9	9	0	100	36
Enough Fuel?	0	0	0	9	0	0	91	45
Buy Enough Fuel?	0	0	0	91	73	0	100	18

* The "% Mentioning Problem" column is not applicable for Level III since the problems were stated for students.

HOW TO OBTAIN JASPER MATERIALS FOR RESEARCH[1]

One of our goals in creating the Jasper series was to make it available to the research community. If you think you might be interested, please read on.

Overview of the Video Part of the Series

There currently are four Jasper adventures: (1) Journey to Cedar Creek (2nd edition); (2) Rescue at Boone's Meadow; (3) The Big Splash and (4) A Capital Idea.

The first two adventures deal with the general issue of trip planning. The second two adventures are more complex and introduce students to key concepts in statistics and ask them to create business plans that are based, in part, on the ability to use randomly selected samples to make arguments about larger populations. Since the characters in the adventures must convince key decision makers, the third and fourth Jaspers can also be used to teach (or to assess) written and oral communication skills.

Two more Jasper adventures will be created during the 1991 - 1992 academic year. Our goal for these adventures is to make geometry meaningful to students by showing how it can be used to accomplish interesting goals.

Prices

In order to encourage research, we are attempting to keep the prices of the materials as low as possible. We are asking researchers to help us recover costs of mastering and copying our videos by paying the following

- $125 per adventure if it is ordered on videodisc (this price includes print teacher materials that accompany each adventure plus $3.50 to cover shipping and handling costs [first class mail.])

- $50 per adventure if it is ordered on videotape (again, this price includes the price of print materials plus $3.50 to cover shipping and handling costs [first class mail]).

General Points

- If you use any of the Jasper materials in your research, you are more than welcome to show any of the video or print materials for purposes of presenting your study to others. However, we ask that you do not make copies of the video or print materials and remind you that they are copyrighted.

- If you want to **preview the materials**, we can send them on tape for a free 30 day loan period although we will ask you to pay for the shipping and handling (see above for these prices). If you fail to return the materials after 30 days, we will bill you.

- If it is at all possible, when you conduct your study we encourage you to use the Jasper adventures on **videodisc** because it is much easier to search for information on disc than it is to search on videotape. Of course, if your study does not require search, tape should be just as good

- We would appreciate comments and descriptions of any findings--whether positive or negative. Our goal is to figure out how to do things better, so we encourage critical comments as well as ideas about possible strengths.

Contact person for more information

Write to Faapio Po'e, Learning Technology Center, Box 45, Peabody, Nashville, TN., 37203. Bitnet address is POEFT@VUCTRVAX. Internet address is POEFT@CTRVAX.Vanderbilt.Edu Fax number is (615)343-7556

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[1] *We are grateful to the National Science Foundation, James S. McDonnell Foundation, Office of Special Education, and Vanderbilt University for helping support this project. Despite their generosity, we do not have enough funds to support free, unlimited distribution to researchers. This is why we are asking for help from you to defray some of our costs. Thanks*